

REMARKS/ARGUMENTS

Claims 25-36 are pending herein. Claims 1-14 and 17-24 have been cancelled without prejudice or disclaimer as being drawn to non-elected inventions. Claims 15 and 16 have been cancelled without prejudice or disclaimer in favor of new claim 25 and 26, respectively. New independent claim 25 corresponds substantially to original claim 15 rewritten in independent form, with the exception that new claim 25 clarifies that the bonding layer includes a composite oxide including at least one alkali metal element and at least one transition metal element (original specification [0015]).

New dependent claims 26-36 have been added to recite the materials from which the claimed bonded article is formed, and thus all of these new dependent claims properly depend, either directly or indirectly, from new claim 25. New claims 26-30 correspond to original claims 2, 7, 8, 9 and 10, respectively, and depend from claim 25 or claim 26. New dependent claims 31 and 32 each recite portions of original claim 11 and depend from claims 29 and 31, respectively. New dependent claims 33 and 34 each recite portions of original claim 12 and depend from claims 30 and 33, respectively. New dependent claims 35 and 36 respectively correspond to original claims 13 and 14, and depend from original claims 25 and 26, respectively.

1. Applicants hereby affirm the provisional election to prosecute claims 15 and 16 in the present application. The non-elected claims have been cancelled without prejudice or disclaimer. As discussed above, new independent claim 25 and dependent claim 26 correspond substantially to original claims 15 and 16, respectively. Applicants presently intend to file a divisional application for the non-elected claims, and thus reserve the right under 35 USC §121.

2. Claim 15 was rejected under §102(b)/103(a) over Quenzer et al. This rejection is moot in light of the cancellation of claim 15. To the extent that this rejection might be applied against new claim 25 (or any claims dependent therefrom), it is respectfully traversed.

Pending independent claim 25 recites that first and second substrates are bonded to one another with a bonding layer. The bonding layer includes a composite oxide including at least one alkali metal element and at least one transition metal element. The applied prior art of record, discussed below, does not disclose or suggest a composite oxide bonding layer including at least one alkali metal element and at least one transition metal element, as claimed.

Applicants discovered that the claimed composite oxide bonding layer, which has a

comparatively higher refractive index versus conventional bonding layers and is superior in thermal cycling properties, allows a relatively thicker light-guiding layer to be bonded to a substrate, while maintaining single mode light propagation through the relatively thicker light-guiding layer. Conversely, prior art structures, such as those discussed below, employing lower refractive index adhesives to bond substrates to one another, are required to use very thin light-guiding layers in order to attain single mode light propagation through the light-guiding layer. When using such thin light-guiding layers and lower refractive index bonding materials, problems arise in that the thickness of the light-guiding layer cannot be easily controlled to be within a desired parameter. In addition, the lower refractive index bonding material, which is similar to window glass, cannot withstand stress and thermal cycling under humid conditions. This in turn results in cracking and delamination at the interface between the bonded substrates. If a relatively thicker light-guiding layer is used in conjunction with the lower refractive index adhesive, in an attempt to cure the above-discussed interfacial zone cracking and delamination problems, the resultant structure is one in which optical signals propagate through the relatively thicker light-guiding layer in a multi-mode fashion, and thus single mode light propagation is not attainable.

The present invention addresses the above-discussed problems in the prior art by employing a composite oxide bonding layer, which includes at least one alkali metal element and at least one transition metal element, to achieve single mode light propagation through a relatively thicker light-guiding layer. The claimed bonded article advantageously provides a bonded structure that is not prone to cracking or delamination at the interface between the bonded substrates, and the spot size of light propagating in the light-guiding layer is comparable to the diameter of an optical fiber coupled to the bonded article.

Quenzer discloses bonding two wafer plates to one another using an aqueous sodium silicate solution (i.e., Na_2SiO_3) as an adhesive layer. Quenzer does not disclose or suggest, however, that the sodium silicate solution adhesive layer includes at least one transition metal element, as recited in pending claim 25. Applicants respectfully submit that Quenzer's alkali metal silicate solution, after heating, is a low refractive index material (similar to window glass), and thus is negatively affected by stress and thermal cycles under humid conditions. This in turn likely results in cracking and delamination at the interface between the bonded substrates. Again, the claimed bonded article advantageously provides a bonded structure that overcomes the problems of cracking and/or delamination at the interface between the bonded substrates, while providing a bonded article in which the spot size of light

propagating through the light-guiding layer is comparable to the diameter of an optical fiber coupled to the bonded article.

In view of all of the foregoing, reconsideration and withdrawal of the §102(b)/103(a) rejection over Quenzer are respectfully requested.

3. Claims 15 and 16 were rejected under §102(b)/103(a) over Patton et al. This rejection is moot in light of the cancellation of claims 15 and 16. To the extent that this rejection might be applied against new claim 25 (or any claims dependent therefrom), it is respectfully traversed.

Similar to Quenzer discussed above, Patton discloses the use of an alkali metal silicate solution to bond substrates to one another. As is the case with Quenzer discussed above, it is clear that Patton does not disclose or suggest a composite oxide including at least one transition metal element, as claimed. Furthermore, for the same reasons discussed above, one would expect Patton's bonded structure, which employs a lower refractive index alkali metal silicate solution as the bonding layer, to be susceptible to the same problems afflicting conventional bonded structures using such lower refractive index adhesive materials.

In view of all of the foregoing, reconsideration and withdrawal of the §102(b)/103(a) rejection over Patton are respectfully requested.

If the Examiner believes that contact with Applicants' attorney would be advantageous toward the disposition of this case, the Examiner is herein requested to call Applicants' attorney at the phone number noted below.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,



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